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FOUR NEW SCORPION SPECIES
BELONGING TO THE GENUS PARUROCTONUS
(Scorpionida: Vaejovidae)

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ABSTRACT: The Paruroctonus group of vaejovid scorpions is discussed and Paruroctonus is reinstated in generic status. Twenty-one species are considered to belong to this genus and are listed. The following four new species are described and named: Paruroctonus arnaudi Williams, Paruroctonus bajae Williams, Paruroctonus borregoensis Williams, and Paruroctonus ventosus Williams. All of the new species are known only from Baja California Norte, Mexico, except P. borregoensis which is known from southern California, near the Mexican border.

INTRODUCTION

In 1931, Carlos Hoffmann described a new genus of vaejovid scorpion which he named Uroctonoides. He distinguished this genus by the small denticles which armed the inferior margin of the movable cheliceral finger, and apparently considered it closely related to the genus Uroctonus judging by the generic name he used. The name Uroctonoides was, however, already occupied and therefore not available for use according

to the provisions of the International Code of Zoological Nomenclature. To correct this, Werner and Mello-Leitao, working independently, proposed names in 1934 to replace Hoffmann's homonym. Werner established the name Paruroctonus in January and Mello-Leitao established the name Hoffmanniellus in June. Werner's name Paruroctonus has since been considered to have priority. In 1965, Gertsch and Allred considered Paruroctonus to have only subgeneric status and made it a subgenus within the genus Vaejovis. This placement was based on the observation that members of genera Vaejovis, Paruroctonus, and Uroctonus have chelicerae very similar in structure and that they could not be readily distinguished by cheliceral characteristics alone. In 1966, Gertsch and Soleglad published an extensive systematic study of the Paruroctonus group and maintained its placement as a subgenus within Vaejovis. Their publication dealt with 12 species, including the description of five new ones.

More recent field study reveals that the Paruroctonus group is much more diverse and complex than was previously believed. Nine new species have since been discovered and described, bringing the total number of species in this group to 21, including the four new ones described in this paper. It is now evident that Paruroctonus should be given the status of a distinct genus rather than being treated as a subgenus under Vaejovis. It is clear that Paruroctonus is very similar in morphology and general appearance to both Uroctonus and Vaejovis, and that much of this similarity is probably due to a common line of descent. However, it also appears that some of the similarity may be due to convergence which has occurred after generic divergence.

Analysis of the denticles which occur on the inferior border of the movable cheliceral finger show the following tendencies: absent in Vaejovis; reduced, but usually more or less apparent in Paruroctonus; absent to strongly developed in Uroctonus. Because of the variability of this characteristic, it now appears inappropriate to use it to distinguish Uroctonus as an entire genus from Vaejovis or Paruroctonus. This did not appear to be a problem when the only known member of Uroctonus was U. mordax, which clearly had these "diagnostic denticles" large and conspicuously developed. However, recent field work has yielded other species of Uroctonus which do not conform to this generic criterion.

It now appears that Paruroctonus can be best differentiated from Uroctonus by the presence of 10 or more middle lamellae in the pectines (this 9 or less in Uroctonus), by having the pedipalp palm somewhat less swollen, and by having the frontal margin of the carapace essentially straight (not deeply bilobed as is generally the case in Uroctonus). Paruroctonus differs from Vaejovis by having more or less distinct denticles on the inferior margin of the movable cheliceral finger (no such denticles in Vaejovis), and by having the two valves of female genital operculum not completely fused together longitudinally along their posterior one-fifth (these valves completely fused together in Vaejovis).

At this time it appears that the following 21 species

belong to the genus Paruroctonus and are so placed:

- Paruroctonus aquilonalis (Stahnke, 1940), (Vaejovis (Paruroctonus)). New combination.
- Paruroctonus arnaudi Williams, new species.
- Paruroctonus auratus (Gertsch & Soleglad, 1966), (Vaejovis (Paruroctonus)). New combination.
- Paruroctonus baergi (Williams, 1967), (Vaejovis). New combination.
- Paruroctonus bajae Williams, new species.
- Paruroctonus bantai (Gertsch & Soleglad, 1966), (Vaejovis (Paruroctonus)). New combination.
- Paruroctonus becki (Gertsch & Allred, 1965), (Vaejovis (Paruroctonus)). New combination.
- Paruroctonus borregoensis Williams, new species.
- Paruroctonus boreus (Girard, 1854), (Scorpio; Vaejovis (Paruroctonus)). New combination.
- Paruroctonus gracilior (Hoffmann, 1931), (Uroctonoides; Hoffmanniellus; Vaejovis (Paruroctonus)).
- Paruroctonus grandis (Williams, 1970a), (Vaejovis). New combination.
- Paruroctonus luteolus (Gertsch & Soleglad, 1966), (Vaejovis (Paruroctonus)). New combination.
- Paruroctonus mesaensis Stahnke, 1957, (Vaejovis (Paruroctonus)).
- Paruroctonus pallidus (Williams, 1968a), (Vaejovis). New combination.
- Paruroctonus shulovi (Williams, 1970b), (Vaejovis). New combination.
- Paruroctonus silvestrii (Borelli, 1908), (Vaejovis (Paruroctonus)). New combination.
- Paruroctonus stahnkei (Gertsch & Soleglad, 1966), (Vaejovis (Paruroctonus)). New combination.
- Paruroctonus utahensis (Williams, 1968b), (Vaejovis). New combination.
- Paruroctonus vachoni Stahnke, 1961 (Vaejovis (Paruroctonus)).
- Paruroctonus ventosus Williams, new species.
- Paruroctonus xanthus (Gertsch & Soleglad, 1966), (Vaejovis (Paruroctonus)). New combination.

ACKNOWLEDGEMENTS

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Paruroctonus arnaudi Williams, new species.
(Figure 1; table 1.)

DIAGNOSIS. Moderate to large species; base color of body golden yellow with distinctive dusky to dark marbling on carapace and mesosomal dorsum; inferior keels of metasoma usually with dusky outline; pedipalp fingers same color as palm. Pedipalp hands with palms swollen, strongly granular keels, and short fingers, fingers moderately scalloped, male with distinctive open proximal space when fingers closed. Pectines with 21 to 25 teeth in females, 26 to 31 in males.

Paruroctonus arnaudi appears similar to Paruroctonus grandis (Williams) and to Paruroctonus silvestrii (Borelli) in basic coloration and structure. Distinguished from P. grandis by the following characteristics: metasomal segments not as elongate; dusky outlining of inferior metasomal keels; pedipalp fingers of male more deeply scalloped and with a distinctly larger open proximal space when the fingers are closed; vesicle more swollen and not as conspicuously hirsute; space between inferior median keels not hirsute; males with a tendency for reduced numbers of pectine teeth; smaller total body size. Distinguished from P. silvestrii by the following characteristics: males with a distinctive proximal space when pedipalp fingers are closed; pedipalp palm ventrally not conspicuously granular; pedipalp palm more swollen; not as darkly marked.

HOLOTYPE. Male. Coloration: Carapace and mesosomal dorsum with distinct dusky marking; interocular region completely yellow; seventh tergum yellow; pectines whitish, no other contrasting color markings.

Carapace: Anterior margin essentially straight; set with six reddish hairs; surface coarsely granular; diad slightly larger than 1/8 carapace width at that point.

Mesosoma: All terga granular; seventh tergum with one pair serrate lateral keels and one obsolescent median keel; sterna smooth; one pair of obsolescent serrate keels on last sternum.

Metasoma: Inferior lateral keels smooth to crenulate on segments I to IV; inferior median keels obsolete on segments I to III, smooth to obsolete on segment IV; area of inferior median keels I to IV set with 3, 4, 4, 5 pairs of stout reddish hairs respectively; inferior intercarinal spaces of segment V granular.

Telson: Ventral surface with about 5 pairs of conspicuous hairs; vesicle smooth and lustrous; no subaculear tubercule.

Chelicerae: Inferior border of movable finger crenulate with small unpigmented denticles; inferior border of fixed finger with denticles at base. Distal teeth of movable finger subequal in size.

Pedipalps: Palm swollen, keels pronounced, three dorsal keels granular, dorsolateral keels smooth; fingers scalloped leaving large open space proximally when fingers closed.

ALLOTYPE. Female. Essentially the same as holotype with the following exceptions: slightly smaller in total body length; wider carapace; fewer pectinal teeth; dorsal dusky markings not as pronounced; smaller space between fingers of

chela when closed; vesicle proportionally larger.

PARATYPE VARIATION. Study of 61 paratopotypes (41 males, 20 females) indicated little significant variation from the structure and coloration of the holotype and allotype. The males varied in total body length from 13 to 59 millimeters, while the females varied from 18 to 58 millimeters. The sample included both adults and juveniles of both sexes; however, mature males were predominant. Pectine tooth count varied from 26 to 31 in males and from 21 to 25 in females. The specimens were quite variable in the expression of melanic marking. A few specimens had melanic markings quite pronounced on the dorsum and underlining the inferior metasomal keels, while a few specimens had this melanism approaching obsolescence. Most specimens were intermediate in that the melanism was distinct but not pronounced; the basic marbled pattern was similar in most specimens. A few specimens had a median nonmelanic area on the mesosomal terga, thus giving the appearance of two broad, dark, longitudinal, dorsal stripes. The juveniles appeared much like adults, but often showed more emphasized melanic marking and less swollen pedipalp palms.

TYPE DATA. The holotype male, allotype, and paratopotypes were collected in the Socorro Sand Dunes, Baja California Norte, Mexico, 12 July 1969, by S. C. Williams and V. F. Lee. The type habitat was essentially an inland extension of the adjacent coastal sand dunes. All specimens were collected during early evening by means of ultraviolet detection. The holotype and allotype are permanently deposited in the California Academy of Sciences.

This species is named "arnaudi" after Dr. Paul H. Arnaud, Curator of Entomology, California Academy of Sciences. Doctor Arnaud has made a number of excellent collections of entomological interest from Baja California through his participation in the Orca Expedition and through his personal collecting trips. He has also significantly encouraged arachnid research and has facilitated such research through the facilities of his department.

Paruroctonus borregoensis Williams, new species.
(Figure 2; table 2.)

DIAGNOSIS. Small species; body entirely pale whitish yellow; inferior lateral keels of metasomal segments I to IV crenular, inferior median keels obsolescent on segment I, lightly crenular on segments II and III; telson with elongate aculeus; male pedipalps with short fingers and swollen palms; pectine teeth 15 to 18 in males, 11 in females.

Related to Paruroctonus luteolus (Gertsch and Soleglad) from which it differs in the following ways: slightly larger in total body size; movable finger of pedipalps slightly shorter than humerus in both sexes; male with distinctly swollen pedipalp palm, and with a small space proximally when the pedipalp fingers are closed.

HOLOTYPE. Male. Coloration: Entire body pale whitish

yellow, with no contrasting color markings.

Carapace: Anterior margin essentially straight, set with three pairs of reddish hairs; carapace surface granular; diad greater than 1/4 carapace width at that point.

Mesosoma: Last tergum with two pairs of dentate granular keels, with one obsolete median keel. Sterna 1 to 6 smooth, sternum 7 finely granular.

Metasoma: Inferior lateral keels I to IV crenular; inferior median keels obsolescent on segment I, lightly crenular on II and III, crenular on IV. Inferior median keels of segments I to IV set with 3, 3, 4, 5 pairs of stout reddish hairs respectively.

Telson: Inferior surface of vesicle with approximately 6 pairs of inconspicuous hairs; entire vesicle conspicuously granular; distinct subaculear tubercule.

Chelicerae: Inferior border of movable finger with about two unpigmented denticles; terminal teeth not subequal, dorsal tooth much smaller; fixed finger with one small unpigmented denticle at the inferior base.

Pedipalps: Dorsolateral keels of palm well developed and granular; inner surface of palm completely granular; fingers subtly scalloped, leaving small distinct space when chela closed.

ALLOTYPE. Female. Essentially the same as holotype with the following exceptions: larger total length; longer and wider carapace; pedipalp chela with fingers proportionally longer and with palm less swollen; pedipalp fingers not distinctly scalloped; metasoma with inferior median keels I to IV obsolete, inferior lateral keels obsolete on I to III; telson with aculeus distinctly more elongate; vesicle smooth and lustrous with hairs longer and more conspicuous.

PARATYPE VARIATION. Study of 29 paratopotypes (22 males, 7 females) indicated little significant variation from the structure and coloration of the holotype and allotype. The males varied in total body length from 27 to 32 millimeters while females varied from 21 to 31 millimeters. The sample appeared to primarily represent adults. Pectine tooth count varied from 15 to 18 in males, and from 9 to 11 in females.

TYPE DATA. The holotype male, allotype, and 29 paratopotypes were collected 13 miles northeast of Borrego Springs, San Diego County, California (elevation 500 feet), 7 October 1967, by M. A. Cazier and party. All specimens were collected during early evening by means of ultraviolet detection. The holotype and allotype are permanently deposited in the California Academy of Sciences.

This species is named "borregoensis" after Borrego Valley in which it was first collected.

Paruroctonus bajae Williams, new species.
(Figure 3; table 3.)

DIAGNOSIS. Moderate sized species; body pale yellow, with light amber pedipalp fingers; metasoma with inferior lateral keels crenulate on segments I to IV, inferior median

keels obsolete on segments I to III, obsolete to crenulate on IV; pedipalp palms swollen, fixed finger shorter than palm, movable finger shorter than carapace, fingers of male with a small open space proximally when the fingers are closed. Males with 19 to 21 pectinal teeth.

Appears related to Paruroctonus borregoensis Williams from which it differs in the following ways: larger body size, amber coloration of pedipalp fingers, and larger numbers of pectine teeth.

HOLOTYPE. Male. Coloration: Entire body pale yellow; pedipalp fingers light amber; no other contrasting markings.

Carapace: Anterior margin essentially straight, but extends slightly more anteriorly at median groove; set with three or four pairs of stout hairs; entire surface coarsely granular; diad slightly more than 1/4 carapace width at that point.

Mesosoma: Terga granular; seventh tergum with two pairs lateral dentate keels, one obsolete median keel; sterna agranular, conspicuously hirsute; seventh sternum with one pair granular lateral keels, median area granular.

Metasoma: Inferior lateral keels crenulate on segments I to IV; inferior median keels obsolete on segments I to III, obsolete to crenulate on segment IV; inferior median keels set with 3, 4, 4, 6 pairs of long conspicuous reddish hairs respectively.

Telson: Ventral surface with long reddish hairs, this surface covered with broad rounded granules; subaculear tubercule present.

Chelicerae: Inferior border of movable finger with subtle unpigmented denticles; terminal teeth not subequal; superior tooth distinctly shorter. Fixed finger with three or four small unpigmented denticles at base of inferior surface.

Pedipalps: Palm of chela with dorsal keels granular; fingers with subtle proximal scalloping, leaving small space when fingers close.

PARATYPE VARIATION. Study of three male paratopotypes indicated little significant variation from the description of the holotype. Females of this species are still unknown. The males varied in total body length from 35 to 39 millimeters and all appeared to be mature. Pectine tooth count varied from 19 to 22.

TYPE DATA. The holotype male and three paratopotypes were collected 8 miles north of Bahia San Luis Gonzaga, Baja California Norte, Mexico, 13 June 1968, by S. C. Williams, M. A. Cazier, and party. All specimens were collected using ultraviolet detection methods. The holotype is permanently deposited in the California Academy of Sciences.

This species is named "bajae" after the Mexican state of Baja California where it appears to be endemic.

Paruroctonus ventosus Williams, new species.
(Figure 4; table 4.)

DIAGNOSIS. Small to moderate sized species; base color of cuticle yellow; dorsum of carapace and mesosoma with more or less indistinct underlying dusky markings. Distinctive characteristics include: metasoma with inferior median keels obsolete on segment I, smooth to obsolete on segments II and III, smooth to crenulate on IV; inferior lateral keels of metasoma smooth to obsolescent on segments I to III, smooth to crenulate on IV; pedipalp palms moderately swollen, male with space between proximal 2/3 of fingers when chela closed; pectine teeth 17 in males, 11 to 13 in females.

Appears similar to Paruroctonus silvestrii (Borelli) and Paruroctonus arnaudi Williams. Distinguished from P. silvestrii by the following characteristics: smaller body size; smaller pectines with significantly fewer teeth in both sexes; more elongate aculeus; open space between fingers when chela closed. Distinguished from P. arnaudi by the following characteristics: smaller body size; reddish pedipalp fingers; significantly fewer pectinal teeth.

HOLOTYPE. Male. Coloration: Base color of cuticle yellow with underlying dusky pigmentation on carapace and mesosomal dorsum; faint dusky markings on metasoma, walking legs, and pedipalps; metasomal segments II to IV underlined with dusky markings, this obsolescent on segment I; fingers of pedipalp light amber.

Carapace: Anterior margin broadly convex; diad 1/4 carapace width at that point; carapace granular.

Mesosoma: Terga granular; last tergum with smooth median keel, two pairs of dentate lateral keels. Sterna smooth and lustrous, last sternum with one pair smooth to crenulate keels.

Metasoma: Inferior lateral keels smooth to obsolescent on segments I to III, smooth to crenulate on segment IV; inferior median keels obsolete on segment I, smooth to obsolete on II and III, smooth to crenulate on IV. Region of inferior median keels set with 3, 4, 4, 5 pairs of stout reddish hairs on segments I to IV respectively. Space between inferior median keels without hairs; inferior intercarinal spaces of segment V granular.

Telson: Vesicle smooth and lustrous, inferior surface with about 9 pairs of long hairs; very subtle subaculear tubercule. Telson long and slender.

Chelicerae: Inferior border of movable finger with three subtle denticles; terminal teeth of movable finger subequal; inferior base of fixed finger lacking denticles.

Pedipalps: Keels of chela distinct, granular; inner surface of palm granular; fingers scalloped, meeting only at proximal ends when fingers closed.

ALLOTYPE. Female. Essentially the same as the holotype with the following exceptions: slightly larger and broader in body size; metasoma proportionally broader; dorsal and dorsolateral keels of metasoma not as distinctly crenulate, dorsolateral keels approaching obsolescence; inferior median keels of metasomal segments I to IV smooth to obsolete;

inferior lateral keels of segments I to IV approaching obsolescence; pectines smaller with fewer teeth; pedipalp palms more elongate, with keels not as heavy, with reduced granulation; internal surface of palm agranular; fingers longer, with distinctly less space remaining when chela closed.

PARATYPE VARIATION. Study of 6 paratypes (all females) indicated little variation from the description of the allotype. These females varied in total length from 30 to 38 millimeters. All individuals appeared to be mature. Pectine tooth counts varied from 11 to 13 (females), and all specimens were very similar in structure and coloration.

TYPE DATA. The holotype male, allotype, and 3 paratypes were collected from the Socorro sand dunes, elevation 200 feet, Baja California Norte, Mexico, on 12 July 1969, by S. C. Williams and V. F. Lee. All specimens were collected in early evening by ultraviolet detection methods. The holotype and allotype are permanently deposited in the California Academy of Sciences.

This species is called "ventosus" because of the nature of the habitat which is characterized by prevalent wind and little shelter from the wind.

LITERATURE CITED

BORELLI, ALFREDO

1909. Scorpioni raccolti dal Prof. F. Silvestri nell' America settentrionale e alle isole Hawaii. Naples Universita, Laboratorio di Zoologia e agraria Bolletina (Portici Bolletina), vol. 3, pp. 222-227.

GERTSCH, WILLIS J., and DORALD M. ALLRED

1965. Scorpions of the Nevada Test Site. Brigham Young University Science Bulletin. Biological Sciences, vol. 6, no. 4, pp. 1-15.

GERTSCH, WILLIS J., and MICHAEL SOLEGLAD

1966. The Scorpions of the Vejoavis boreus Group (Subgenus Paruroctonus) in North America (Scorpionida, Vejovidae). American Museum Novitates, no. 2278, pp. 1-54.

GIRARD, CHARLES

1854. (In) Marcy's Exploration of the Red River of Louisiana in 1852. 33rd Congress, 1st Session, Senate Executive Document, pp. 251-259.

HOFFMAN, CARLOS C.

1931. Monografias para la entomologia medica de Mexico, Monografia Numero 2 -- Los Scorpiones de Mexico. (Primera Parte). Diplocentridae, Chactidae, Vejovidae. Universidad Nacional de Mexico, Anales del Instituto de Biologia, vol. 2, no. 4, pp. 291-408.

MELLO-LEITAO, C.

- 1934 (June 30). A proposito de um novo vejovida de Brasil. Annaes da Academia Brasileira de Ciencias, Rio de Janeiro, tomo 6, no. 2, pp. 75-82.

STAHNKE, HERBERT L.

1940. Scorpions of Arizona. Iowa State College Journal of Science, vol. 15, pp. 101-103.
1957. A New Species of Scorpion of the Vejovidae: Paruroctonus mesaensis. Entomological News, vol. 68, no. 10, pp. 253-259.
1961. A New Species of Scorpion of the Vejovidae: Paruroctonus vachoni. Entomological News, vol. 72, no. 8, pp. 206-212.

WERNER, FRANZ

- 1934 (January). Scorpiones, Pedipalpi. (In) Bronns, H. G., Klassen und Ordnungen des Tierreichs, 5 Band: Arthropoda; IV. Abteilung: Arachnoidea; 8 Buch. Akademische Verlagsgesellschaft M.B.H., Leipzig, 316 pp.

WILLIAMS, STANLEY C.

- 1968a. Scorpions from Northern Mexico: Five New Species of Vejovis from Coahuila, Mexico. Occasional Papers of the California Academy of Sciences, no. 68, 24 pp.
- 1968b. Two New Scorpions from Western North America. The Pan-Pacific Entomologist, vol. 44, no. 4, pp. 313-321.
- 1970a. Scorpion Fauna of Baja California, Mexico: Eleven new species of Vejovis (Scorpionida: Vejovidae). Proceedings of the California Academy of Sciences, Fourth Series, vol. 37, no 8, pp. 275-332.
- 1970b. Three new species of Vejovis from Death Valley California (Scorpionida: Vejovidae). The Pan-Pacific Entomologist, vol. 46, no. 1, pp. 1-11.

WILLIAMS, STANLEY C., and NEIL F. HADLEY

1967. Scorpions of the Puerto Penasco area (Cholla Bay), Sonora, Mexico, with description of Vejovis baergi, new species. Proceedings of the California Academy of Sciences, Fourth Series, vol. 35, no. 5, pp. 103-116.

TABLE 1. Measurements (in millimeters) of Paruroctonus arnaudi Williams, new species, holotype and allotype.

	Holotype (male)	Allotype (female)
Total length	64.0	60.0
Carapace, length	6.9	7.5
width (at median eyes)	5.3	5.8
Metasoma, length	30.9	28.1
segment I (length/width)	4.2/3.8	3.8/3.9
segment II (length/width)	5.0/3.6	4.5/3.6
segment III (length/width)	5.5/3.4	4.7/3.4
segment IV (length/width)	6.7/3.2	5.8/3.2
segment V (length/width)	9.5/2.9	9.3/3.0
Telson, length	8.6	8.8
Vesicle (length/width)	5.6/3.2	5.9/3.9
depth	2.8	3.3
Aculeus, length	3.0	2.9
Pedipalp		
Humerus (length/width)	6.3/2.0	6.0/2.0
Brachium (length/width)	6.5/2.8	6.7/2.0
Chela (length/width)	11.8/3.4	11.4/3.4
depth	4.4	4.0
movable finger, length	7.5	7.3
fixed finger, length	5.8	5.3
Pectines, teeth (left/right)	28/28	23/22

TABLE 2. Measurements (in millimeters) of Paruroctonus borregoensis Williams, new species, holotype and allotype.

	Holotype (male)	Allotype (female)
Total length	30.0	35.0
Carapace, length	3.7	4.8
width (at median eyes)	2.5	3.4
Metasoma, length	16.0	16.8
segment I (length/width)	2.2/1.8	2.4/2.3
segment II (length/width)	2.7/1.8	2.8/2.2
segment III (length/width)	2.8/1.7	2.9/2.0
segment IV (length/width)	3.6/1.6	3.7/1.8
segment V (length/width)	4.7/1.5	5.0/1.8
Telson, length	3.8	4.6
Vesicle (length/width)	2.3/1.1	2.4/1.6
depth	1.0	1.4
Aculeus, length	1.5	2.2
Pedipalp		
Humerus (length/width)	2.9/1.0	3.1/1.2
Brachium (length/width)	3.1/1.2	3.6/1.5
Chela (length/width)	4.7/1.6	5.3/1.4
depth	2.2	1.6
movable finger, length	2.7	3.0
fixed finger, length	1.8	2.2
Pectines		
teeth (left/right)	16/17	11/11

TABLE 3. Measurements (in millimeters) of Paruroctonus bajae Williams, new species, holotype.

	Holotype (male)
Total length	37.0
Carapace, length	4.3
width (at median eyes)	3.2
Metasoma, length	18.0
segment I (length/width)	2.6/2.2
segment II (length/width)	3.1/2.0
segment III (length/width)	3.2/2.0
segment IV (length/width)	4.0/1.8
segment V (length/width)	5.1/1.7
Telson, length	4.7
Vesicle (length/width)	2.8/1.6
depth	1.2
Aculeus, length	1.9
Pedipalp	
Humerus (length/width)	3.4/1.1
Brachium (length/width)	3.6/1.5
Chela (length/width)	5.9/1.8
depth	2.3
movable finger, length	3.2
fixed finger, length	2.3
Pectines	
teeth (left/right)	20/20

TABLE 4. Measurements (in millimeters) of Paruroctonus ventosus Williams, new species, holotype and allotype.

	Holotype (male)	Allotype (female)
Total length	34.0	35.0
Carapace, length	4.0	4.8
width (at median eyes)	3.0	3.4
Metasoma, length	15.3	15.3
segment I (length/width)	2.0/1.9	2.1/2.3
segment II (length/width)	2.4/1.8	2.4/2.1
segment III (length/width)	2.7/1.7	2.6/2.0
segment IV (length/width)	3.4/1.5	3.3/1.8
segment V (length/width)	4.8/1.4	4.9/1.6
Telson, length	4.1	4.7
Vesicle (length/width)	2.5/1.4	2.6/1.5
depth	1.1	1.2
Aculeus, length	1.6	2.1
Pedipalp		
Humerus (length/width)	3.1/1.1	3.2/1.3
Brachium (length/width)	3.4/1.6	3.9/1.8
Chela (length/width)	5.6/1.8	6.2/1.7
depth	1.4	2.2
movable finger, length	3.3	3.8
fixed finger, length	2.4	2.7
Pectines		
teeth (left/right)	17/17	12/12

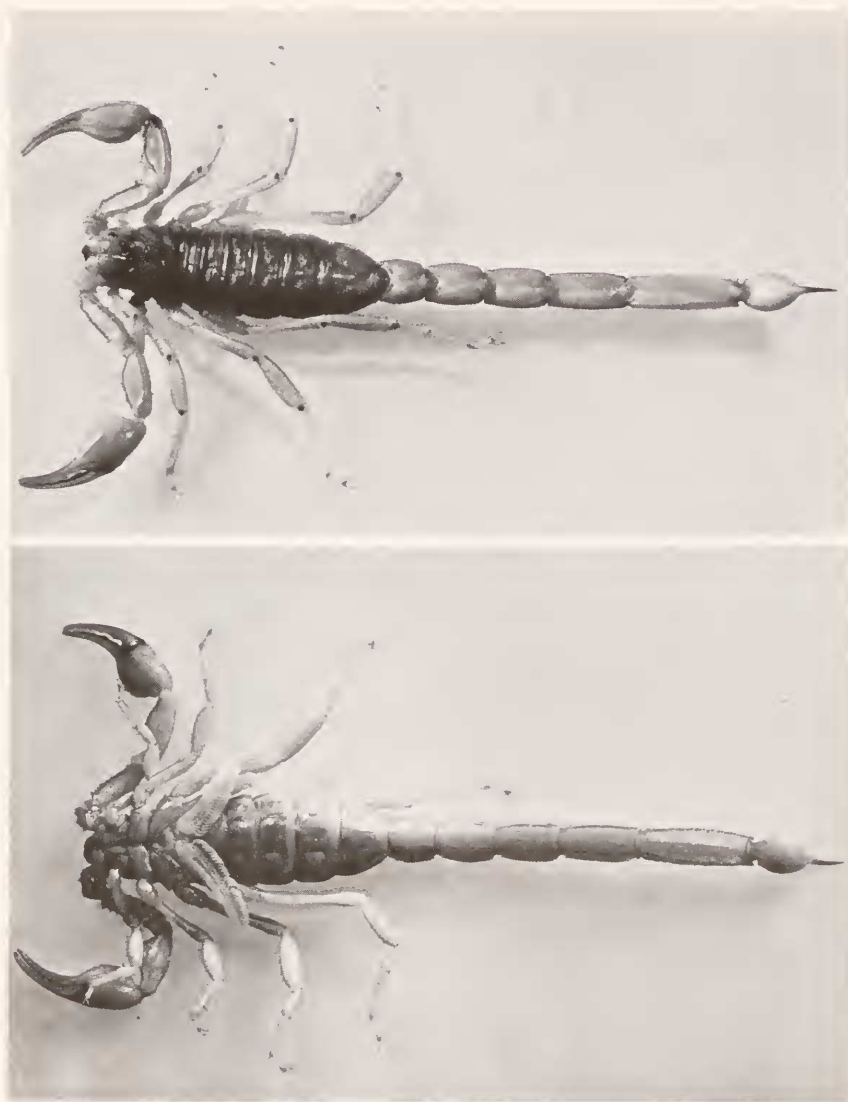


FIGURE 1. Paruroctonus arnaudi Williams, holotype male. Dorsal view above, ventral view below.

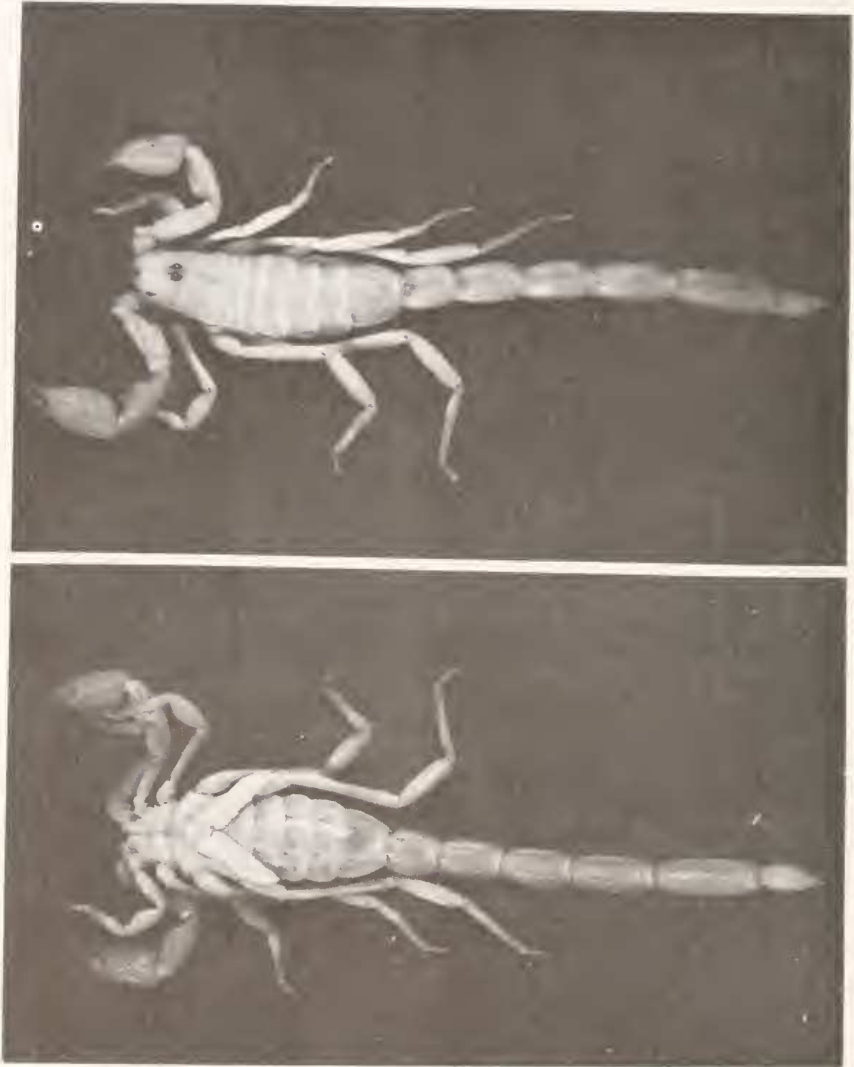


FIGURE 2. Paruroctonus borregoensis Williams, holotype male. Dorsal view above, ventral view below.

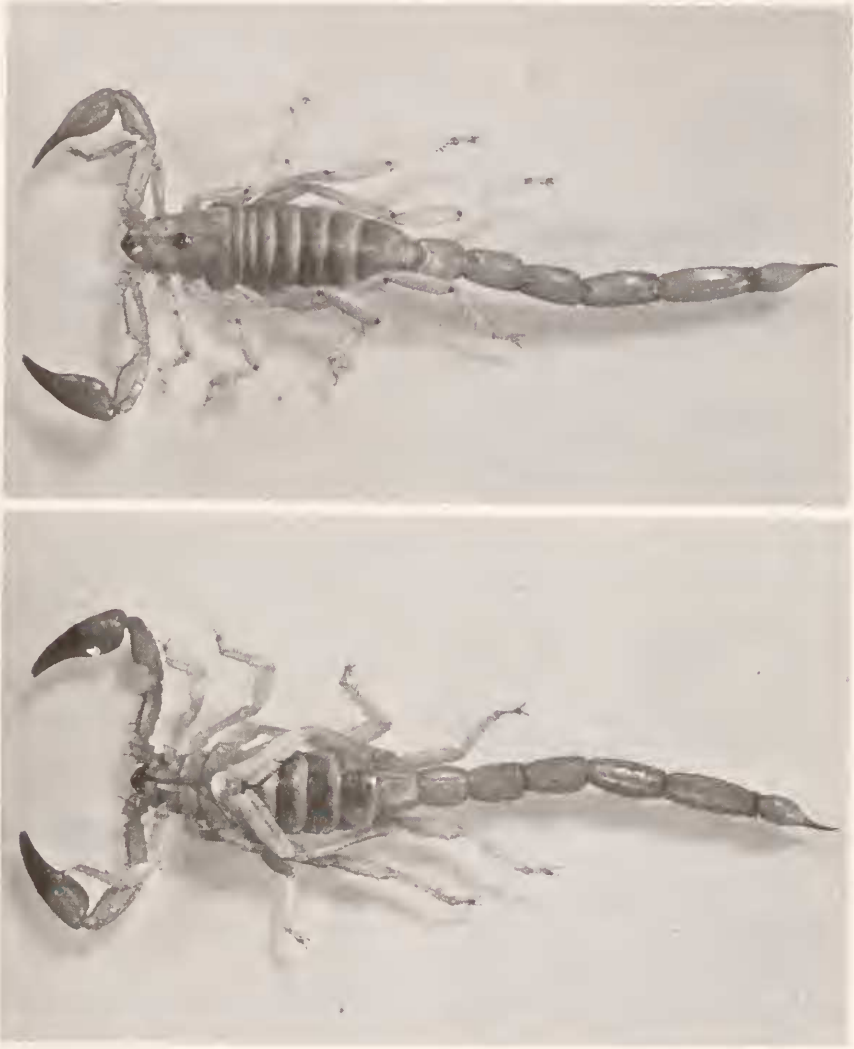


FIGURE 3. Paruroctonus bajae Williams, holotype. Dorsal view above, ventral view below.

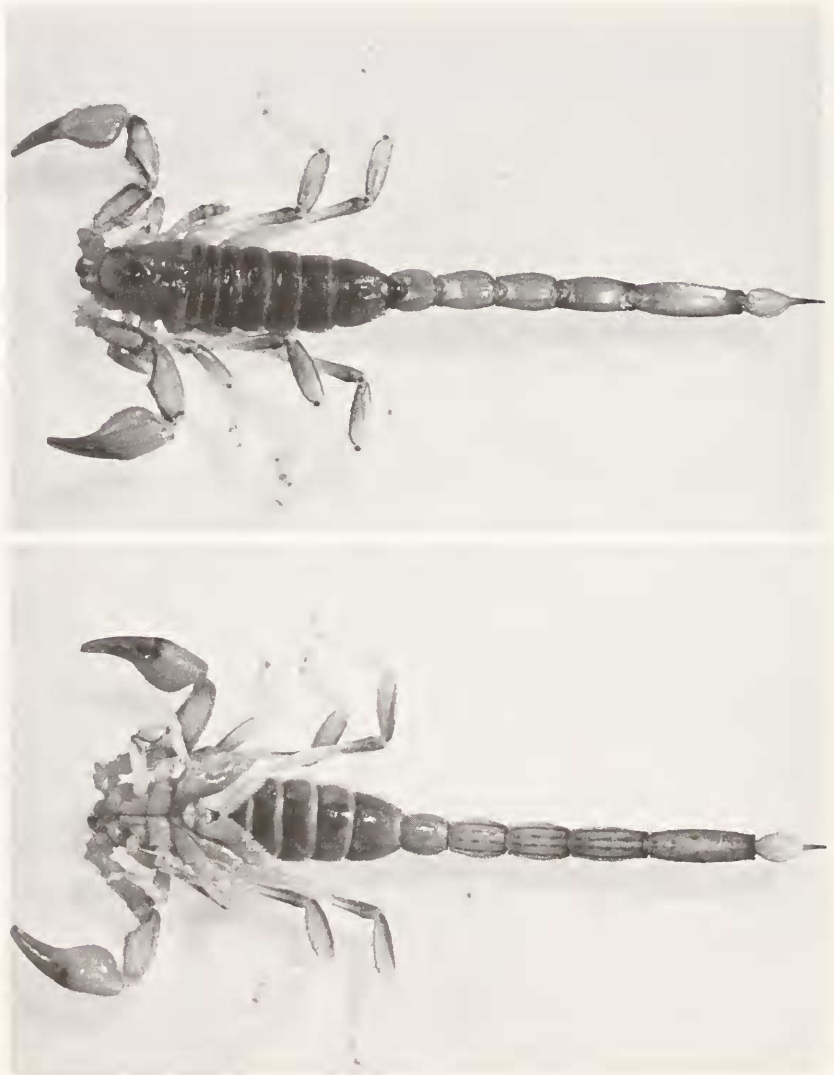


FIGURE 4. Paruroctonus ventosus Williams, holotype male. Dorsal view above, ventral view below.